Long-range versus short-range prehistoric pastoralism. Potential of palaeoecological proxies and a new record from western Emilia, northern Apennines, Italy

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Abstract

The timing of the rise of upland pastoralism and the extent of the seasonal mobility of early shepherds are key issues in the later prehistory of the Mediterranean. The archaeological record from Liguria (NW Italy), points to an increasing relevance of animal husbandry since the beginning of the Middle Neolithic, from the 5th millennium BC onwards. Thick stabling deposits and zooarchaeological assemblages from cave sites show the importance of sheep and cattle farming. Moreover, palaeoecological data from bogs and mires have suggested the use of pastures located at mid-high elevations and anthropogenic landscape modifications. The paper re-discusses the debated issue of long- vs short-range transhumant pastoralism in view of the archaeological and palaeoecological data from the region. A new case study is presented: dung spore analysis has been carried out from a high-altitude mire located in western Emilia, suggesting the possibility of a limited environmental impact of the first pastoral groups and of a stable presence of wild ungulates around the site.

Key words

Pastoralism; transhumance; Neolithic; non-pollen palynomorphs; Liguria; Emilia

Introduction

In the last three decades, a number of archaeological and palaeoecological investigations have stressed the importance of early animal domestication and husbandry in south-western Emilia and Liguria (Barker *et al.* 1990; Maggi and Nisbet 1991; Maggi 2004a). The neolithisation of the area begins around 7800-7700 BP as evidenced by Impressed Ware pottery, which expands all along the coasts of the western Mediterranean during the 8th millennium BP (Maggi 1999).The Middle Neolithic (*c.* 7000-6200 BP) is characterised by the appearance of the Square-Mouthed Pottery culture (VBQ) and by the development of animal farming, although hunting, gathering and fishing are still prevalent (Bagolini and Pedrotti 1998). The shift to the Late Neolithic shows the spread of Chassey groups from south-east France, herding gains more relevance and pigs are introduced (Maggi 2004b; Maggi and Campana 2008). In Liguria, most of the evidence for the Middle and Late Neolithic comes from a number of rock shelters and caves located on the western coast of the region, while there are scant indications of open-air sites, which is probably an effect of their lesser archaeological visibility (Maggi 1999). Considerable bone assemblages have being recovered, showing a prevalence of domestic species such as sheep, goats and cows (Rowley-Conwy 1997). A seasonal or continuous occupation has been suggested for these sites (Barker *et al.* 1990; Maggi and Nisbet 1991). The picture resulting from the best known cave of Arene Candide indicates the presence of the herd within the cave, probably used as a seasonal or permanent stable, with occasional episodes of human occupation (Rowley-Conwy 1997). In the Late Neolithic, multiple natural archives in eastern Liguria seem to point to significant landscape modifications, involving the use of fire to create open pastures (Maggi 2004a). However, a clear relationship with anthropogenic disturbance remains dubious (Branch 2013; Branch and Morandi 2015), as the contemporaneous archaeological evidence is mainly found on the western coast. A few findings from Castellaro di Uscio and Tana delle Fate, though, seem to suggest the presence of Chassey groups also in the eastern part (Branch *et al.* 2014).

Regarding western Emilia, the large and fertile plain around Parma was densely inhabited during the Neolithic. Before the emergence of the VBQ culture, in the Early Neolithic the Fiorano culture emerges as a distinct facies (Bagolini and Biagi 1977). Many open-air settlements were identified, some of them reaching a noticeable extent (Degasperi *et al.* 1998). Although they are less known than the contemporary

north-eastern sites in Friuli, there is evidence for plant domestication since the Early Neolithic (second half of the 8th millennium BP) (Rottoli and Castiglioni 2009). However, faunal assemblages show a high proportion of wild species, and subsistence strategies are not clearly known as yet (Bagolini and Pedrotti 1998; Rowley-Conwy *et al.* 2013).

The origin and characteristics of the first transhumance in southern Europe have long been discussed (Arnold and Greenfield 2006; Jourdan-Annequin and Duclos 2006; Maggi *et al.* 1991). In broad terms, this form of livestock management involves the seasonal movement of flocks to upland pastures during the summer months, under the care of one or more shepherds (Arnold and Greenfield 2003; Braudel 1949). The method aims to make the best possible use of resources exploiting the richness of the mountain pastures in the warm season and avoiding drought in the valleys (Sullivan and Homewood 2003) (Figure 1). In the cold season, the herds are kept in the permanent lowland settlements. This practice may leave a trace in livestock diet, as it has been demonstrated for Swiss lake shore settlements (Akeret and Jacomet 1997; Akeret *et al.* 1999).

There is a certain degree of confusion around the definition of transhumance, especially in terms of horizontal transhumance as this often merges with the concept of nomadism (Cribb 1991). It would be incautious, however, to label prehistoric forms of herding with any of the modalities known in the better documented post-Roman centuries. It is possible that in prehistory the practice had a character of short-range nomadism involving the movement of a single family group along the route (Maggi 2004c). This may be indicated by the skeletons found in the high-altitude cave of Grotta del Pertuso (1330 m a.s.l.), used as a burial site for individuals of both genders and various ages (Maggi and Nisbet 1991).

The data from our study region, based upon evidence from archaeological sites and palaeoenvironmental records suggest a gradually more frequent use of mountain pastures as early as the Late Neolithic (Branch and Marini 2014). The signal seems to become increasingly stronger during the Copper and Bronze Age, when important landscape modifications associated with burning episodes and woodland clearance occur. The evidence includes pastures located at very high altitudes. The shelter of Tana del Barletta (950 m a.s.l.) was used a stable between the Late Neolithic and the Bronze Age, suggesting a seasonal exploitation of the pastures of Mt. Galero at 1700 m a.s.l. (Barker *et al.* 1990). Indirect evidence for high-altitude herding is also indicated by a number of rock engravings found on Mt. Bego (above 2000 m a.s.l.) and dated to the Copper and Bronze Age (De Lumley 1984; Maggi 1998a, 2004a; Maggi and Nisbet 1991). It has been suggested that only small groups of individuals were involved in these first pastoral

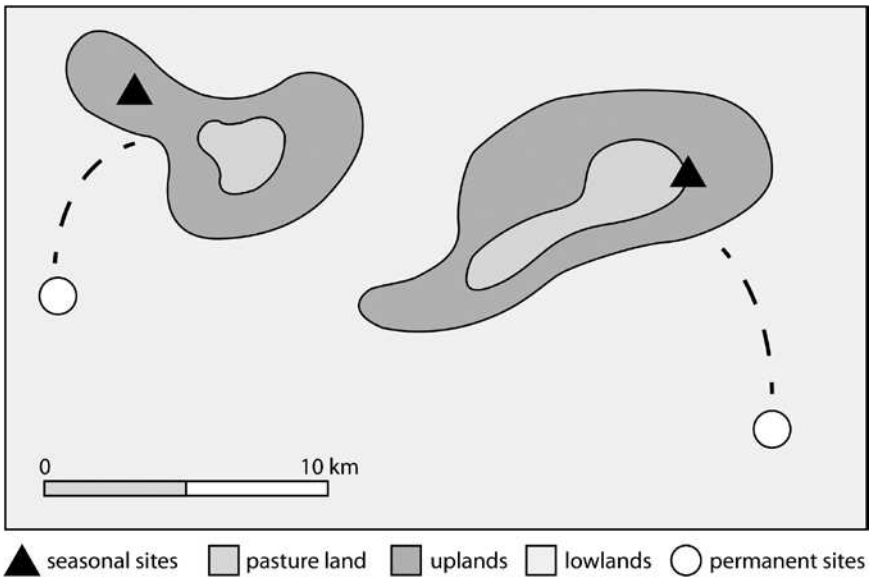

Figure 1. Schematic model of short-range vertical transhumance.

activities (Maggi and Nisbet 1991). This point should be taken into consideration when interpreting palaeoecological records from lakes and mires, because small populations may have had restricted spatial impact on the environment and therefore produced only a weak anthropogenic signal.

It has been suggested that Tana del Barletta and Arene Candide should be viewed as part of a pastoral system linking these sites to possible villages located in the plain of Albenga, some 20 km away on the coast (Maggi and Nisbet 1991). However, on the basis of the cull of domestic species, Rowley-Conwy (1997) has argued that Arene Candide was occupied all year long and should thus be seen as a permanent outlying settlement. Moreover, the site is not located in the highlands, therefore it cannot be part of a vertical farming system.

With very few exceptions (Spindler 1994, 2003), long-range transhumance (>100 km) is considered implausible in prehistory, because it is dependent on extensive social and economic networks only found later in the Roman and especially medieval periods (Barker 1985; Marzatico 2007; Robb 2007).

Beyond environmental archives: the potential of local proxies to unveil evanescent extra-settlement areas

Since the start of large-scale field survey projects in the 1970s and 1980s (Macready and Thompson 1985), archaeologists struggle with the interpretation of extra-settlement (off-site) areas. In spite of their apparent marginality, they have often been of primary importance for ancient societies (de Haas 2012). The relevance of such places is not restricted to their use for resource exploitation, but embraces wider cultural aspects. A paradigmatic case is that of classical antiquity, as it shows that even urbanised societies characterised by large metropoleis and complex production systems still felt the necessity to express their links to wilderness and rural environments, as largely indicated by several literary sources and pagan feasts (Bradley 2000; Dumézil 1996). A number of anthropological studies equally show the unsuspected relevance of various extra-settlement areas, most of which would result in a total lack of archaeological visibility (see e.g. Turner 1967). However, the whole debate on off-site distributions in archaeology deals with the interpretation of material culture (chiefly potsherds) scattered on the landscape surface.

It is here suggested that it may be possible to go beyond the use of suitable natural archives as mainly means of reconstructing environmental conditions associated with human occupation. Arguably, a further approach to identifying potential extra-settlement areas may be attempted through the use of local proxies for periodic human presence. Several survey projects have faced the difficulty of interpreting areas of apparent low activity beyond the settlement sites (Bintliff and Snodgrass 1988). Then, at a later stage of the research, the excavations tend to focus solely on more promising areas characterised by stronger evidence, and there is little work to interpret the meaning of off-site distributions (de Haas 2012). Moreover, because these areas are defined by a very low number of artefacts, it seems highly likely that a large number of them are not detectable at all due to a total absence of remains. Local anthropogenic proxies may be applied to address this problem, and a project following such an approach should involve mapping and sampling of each geological archive proximal to the sites, rather than focusing only on the deepest and best preserved sequence for environmental reconstruction.

It appears essential that, to identify extra-settlement areas, the best proxies have to be strictly local indicators, as is the case of NPPs and waste-derived biomarkers (human and animal stanols/sterols and bile acids). To demonstrate the potential of this approach, we point out that most of the structures and finds associated with off-site areas in field survey projects relate to pastoral activities (de Haas 2012). It is worth stressing that sampling locations do not have to be restricted to wetlands, as biogeochemical analyses can be successfully performed also in dry areas to detect manuring practices in ancient fields (Bull *et al.* 2001; Evershed *et al.* 1997). Similarly, soil profiles are valuable sources of palynomorphs (Dimbleby 1985), as well as of resilient fungal spores and parasite eggs. Furthermore, the most commonly advocated explanation for interpreting off-site areas consists of the so-called

'manuring hypothesis' (Bintliff and Snodgrass 1988). The specific use of local proxies for animal- and human-derived wastes seems therefore particularly suitable to test this hypothesis, and if successful it would result in a more detailed knowledge of land-use strategies nearby the site. The identification of extra-settlement areas is crucial to locate settlement sites in their broader landscape context, allowing insights into environmental exploitation and economic systems. In favourable circumstances also sedimentary sequences from natural archives can provide meaningful information on extra-site distributions and their exploitation, helping to establish links between them and periodic human presence. These circumstances are listed below:

- chronological correlation between evidence for local anthropogenic activities from geological archives and archaeological evidence in the study area;
- spatial relationship between potential extra-settlement areas and settlements (e.g. distance between grazing lands and permanent sites);
- match between the palaeoecological indicators recovered and the subsistence strategy (if known) of contemporary communities settled in the study area.

At the present state of research, for the reasons given above, this approach is best applicable to the socio-economic context of pastoral societies, regardless of their location in space and time. It is worth saying that, in the last forty years, a similar approach has been tentatively applied by means of phosphorus analysis. However, this method presents several technical and interpretative issues (Holliday and Gartner 2007), and is less directly linkable to a specific type of human activity, e.g. areas of food waste would appear as very phosphate-rich and indistinguishable from heavily grazed areas.

A case study from an upland peat bog: Prato Spilla 'A'

Geographical setting and previous work

Located on the northern slope of Mt. Bocco, the area of Prato Spilla lies about 40 km north of the town of La Spezia and 65 km south of Parma (Figure 2). The name Prato Spilla 'A' refers to the highest (1560 m a.s.l.) of three marshy mires surrounded nowadays by beech forest (44°21'16''N 10°05'51''E). The basin, measuring *c.* 40 m along its major axis, overlies 9 m of sediments that have accumulated on the site since the Early Holocene (Figure 3). The sequence has been investigated for palaeoenvironmental reconstruction, and this has suggested that human impact has possibly played a role in determining vegetation changes on the site as early as the Middle Holocene (Lowe 1991, 1992; Lowe *et al.* 1994a, 1994b). According to palynological analyses, the trends followed by arboreal taxa may point to anomalies caused by Neolithic communities, notwithstanding the high altitude of the site. Coupling this evidence with lithological discontinuities indicating erosional events, the authors identified three episodes of possibly stronger human influence, two of which corresponding respectively to the Middle Neolithic and the start of the Copper Age (Lowe *et al.* 1994a, 1994b).

Given this seemingly compelling evidence for human activity during the Neolithic at high altitude, the site has been selected as a promising case study for non-pollen palynomorph (NPP) analysis. The identification of coprophilous fungal spores is currently one of the few existing methods for assessing the local presence of herbivores outside archaeological sites in the absence of faunal remains (Linseele *et al.* 2013), and it proves particularly suitable when investigating a region long inhabited by pastoral societies.

Materials and methods

On July 2012, a 730 cm long core was taken using a Russian sampler. The sampling spot is located *c.* 15m from the northern edge of the basin, next to a minor pool. Subsamples of 1 cm^3 were taken from the core every 8 cm from the part of the sequence comprised between 730 to 602 cm, and every 16 cm between 602 and 442 cm.

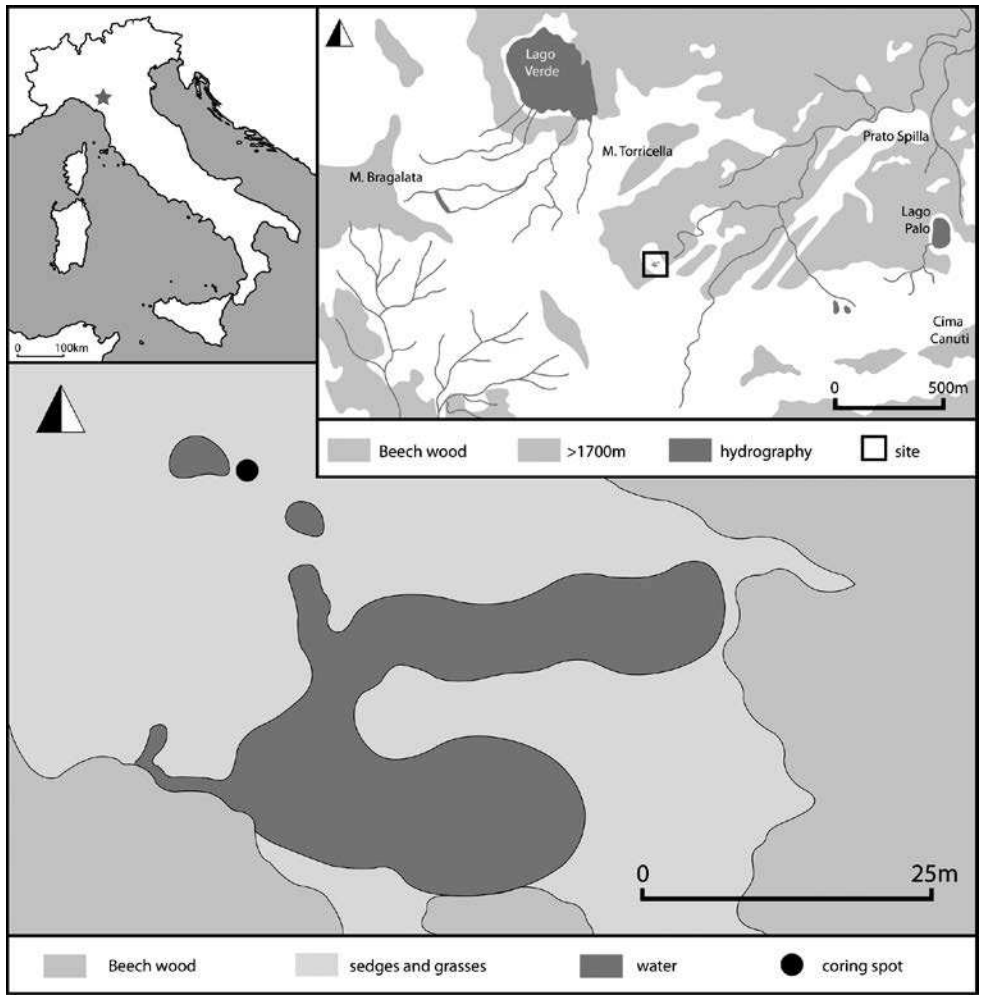

Figure 2. Prato Spilla 'A': map showing the location of the site.

Figure 3. Prato Spilla 'A': view of the site from the south-east.

During the editing of this volume, four radiocarbon dates were obtained for the depths 723-722 cm (OxA-34439: 8457-8341 cal BP at 95,4%), 667-666 cm (OxA-34440: 7579-7441 cal BP at 95,4%), 540-539 cm (OxA-34441: 5844-5601 cal BP at 95,4%) and 490-489 cm (OxA-34674: 4861-4655 cal BP at 95,4%). Dates were modelled in OxCal v.4.2.4, using IntCal13 calibration curve (Bronk Ramsey 2009; Reimer *et al.* 2013). An age-depth model for the whole sequence will be created in the near future.

Microscope slides were prepared at the University of Reading following sieving through 125 and 10 µm meshes and acetolysis treatment prior to mounting in

glycerol jelly. A Leica DME light microscope was used for the analysis (x400 and x1000 magnification). A number of articles were used as reference material for the identification of microfossils, among which: Gelorini *et al.* 2011, van Geel 1978, van Geel *et al.* 1981, 1989, 2003. In total, 27 samples were analyzed, with counts including a minimum of 200 spores and fungal hyphopodia. As non-pollen palynomorphs (NPPs) were counted separately from pollen grains, NPP values are expressed as percentages of total non-pollen palynomorphs (TNPP) (Cugny *et al.* 2010). The sequence was divided into five non-pollen palynomorph assemblage zones (NPPAZs), according to the main variations in the whole NPP spectrum (not presented in the diagram).

Middle Holocene herbivores at Prato Spilla 'A': a purely natural condition or a conditioned nature?

A wide range of coprophilous and potentially coprophilous spores have been recorded, confirming the presence of grazing animals on the site (Figure 4). Some of these (*Sporormiella*-type, *Sordaria*-type, *Delitschia*) represent highly reliable proxies for the local presence of herbivores. Dung spores appear to be distributed across the whole sequence, although there seems to be a slightly higher concentration at the bottom, throughout NPPAZ-2 and between NPPAZs-4 and 5. *Chaetomium* and *Gelasinospora* were identified too. Although these taxa are not obligatory coprophilous, the latter is worthy of note as it is a fire-loving genus (Ellis and Ellis 1988), potentially indicating biomass burning. Among the other occasionally

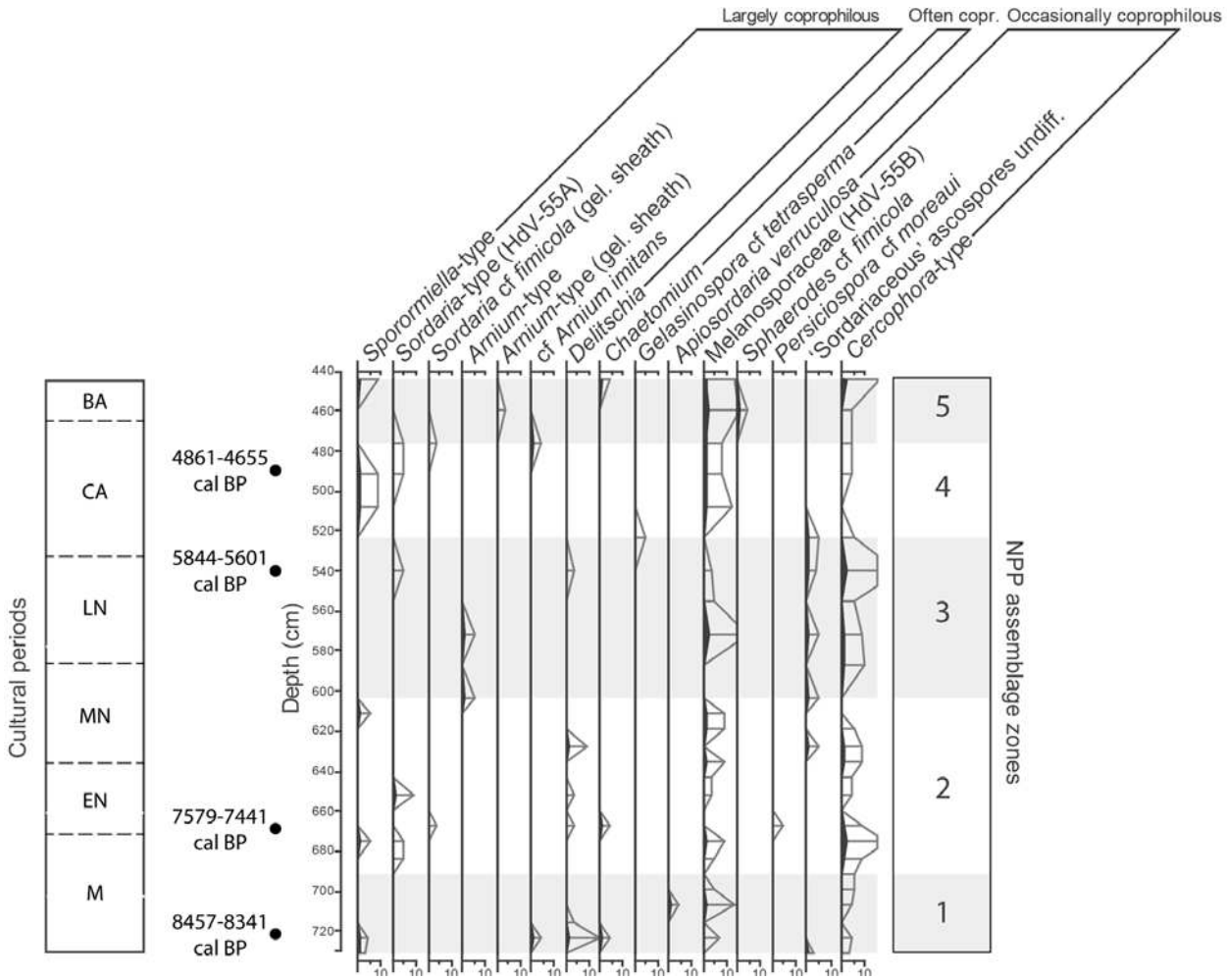

Figure 4. Prato Spilla 'A': selected percentage diagram showing the occurrence of obligate and occasionally coprophilous fungal taxa (total NPP%). Empty curves represent 10x exaggeration. M: Mesolithic; EN: Early Neolithic; MN: Middle Neolithic; LN: Late Neolithic; CA: Copper Age; BA: Bronze Age.

coprophilous taxa, *Cercophora*-type and type 55B were abundant. Although several coprophilous *Cercophora* species exist, their spores may also derive from rotten wood, so they cannot be directly associated with grazing pressure. Type 55B (van Geel 1978) requires further research. It strongly resembles *Melanospora brevirostris* – which is sporadically isolated from herbivore dung (Doveri 2007) – but it may also represent non-coprophilous *Sphaerodes* spp. (F. Doveri, pers. comm., 2014). This microfossil seems to be slightly more abundant at the top of the sequence. According to the newly obtained radiocarbon dates, this part of the deposit corresponds to the Late Neolithic, Copper Age, and Copper/Bronze Age transition (NPPAZs-3, 4 and 5).

It is not possible to detect any particular rise in the percentages, suggesting that the abundance of obligate and potentially coprophilous taxa, spanning from the Late Mesolithic to the Early Bronze Age, is likely to mostly reflect a natural background noise. A similar picture has resulted from the palaeoecological records in the Ötztal Alps, showing no considerable rises in pasture indicators prior to the Middle Bronze Age (*c.* 1600 BC) (Festi *et al.* 2014). The signal detected was thus probably produced by the periodic or continuous presence of mountain wild herbivores grazing around the mire (e.g. ungulates and leporids).

These data help to reinterpret episodes of vegetation changes based upon previous studies (Lowe *et al.* 1994a, 1994b). In particular, modern analogue studies on mountain browsing animals turn out to be enlightening to our case. Controlled experiments have demonstrated how seriously roe deer populations can affect silver fir growth and regeneration, favouring young saplings as feed (Senn and Suter 2003; a similar view is expressed by Cruise *et al.* 2009 in relation to Lago di Bargone in Liguria). Irregular variations in the tree taxa were already noted by Lowe *et al.* (1994a, 1994b), and *Abies* fluctuations may therefore have been at least partly driven by animal disturbance. On a regional scale, however, the widespread *Abies* decline recorded on several sites (Branch and Marini 2014; Arobba *et al.* 2016) was probably caused by climatic factors (Branch 2013) or by a combination of climate change and human impact (Vescovi *et al.* 2010), possibly coupled with pathogens (Menozzi *et al.* 2010). Roe deer, along with red deer, ibex and chamois, are well documented in the zooarchaeological record of the region (Rowley-Conwy 1997; Lorenzini *et al.* 2002). Such a reconstruction appears to be supported by the occurrence in the sequence of the parasitic fungus *Kretzschmaria deusta*, favouring environments characterised by intense animal browsing and trampling (Innes *et al.* 2006).

Alternatively, a more anthropogenic scenario may be pictured in the case the curves of type 55B and *Cercophora*-type would entirely represent coprophilous species. If so, it may be suggested that their slight increase from NPPAZ-3 onwards derives from a more continuous presence of small domestic flocks around the mire. However, further points against this argument exist. While coastal or upland grazing lands suitable as pastures are located at a relatively short (0-10 km) distance from the cave sites of western Liguria, Prato Spilla 'A' appears rather isolated.

As mentioned above, Maggi and Nisbet (1991) have found plausible a seasonal movement of shepherds along distances of maximum 20 km. Although there are no sharp boundaries to define transhumance modalities, a greater distance should be termed as medium/long-range transhumance, and there is general agreement on the unlikelihood of long-distance pastoral systems in prehistory (Barker 1985; Marzatico 2007). It seems also necessary to stress that in previous studies the site of Prato Spilla 'A' has been considered in the context of a well-developed tradition of environmental archaeology focusing solely on Liguria (e.g. Lowe *et al.* 1994b). However, its position on the northern side of the Liguro-Emilian watershed suggests taking into account also the archaeological evidence in the area north of Valditacca. Here, as the last northern Apennine slopes decline, a wide plain extends around the territory of Parma. The area was densely populated during the Neolithic, and culturally dissimilar from the Ligurian milieu (particularly in the Early Neolithic) (Pessina and Tiné 2008). If we turn our attention to the plain of Parma, we note that its southern fringes lie about 20 km from Prato Spilla. The important settlement of Sant'Ilario d'Enza (Maffi and Tirabassi 2013) is located some 30 km from the site (like Pianaccia di Suvero in Liguria), and sporadic Neolithic artefacts are documented also in the near site of San Polo d'Enza (Tirabassi 1987). Further south-east, a Late Eneolithic lithic assemblage was found at Bagioletto, a site

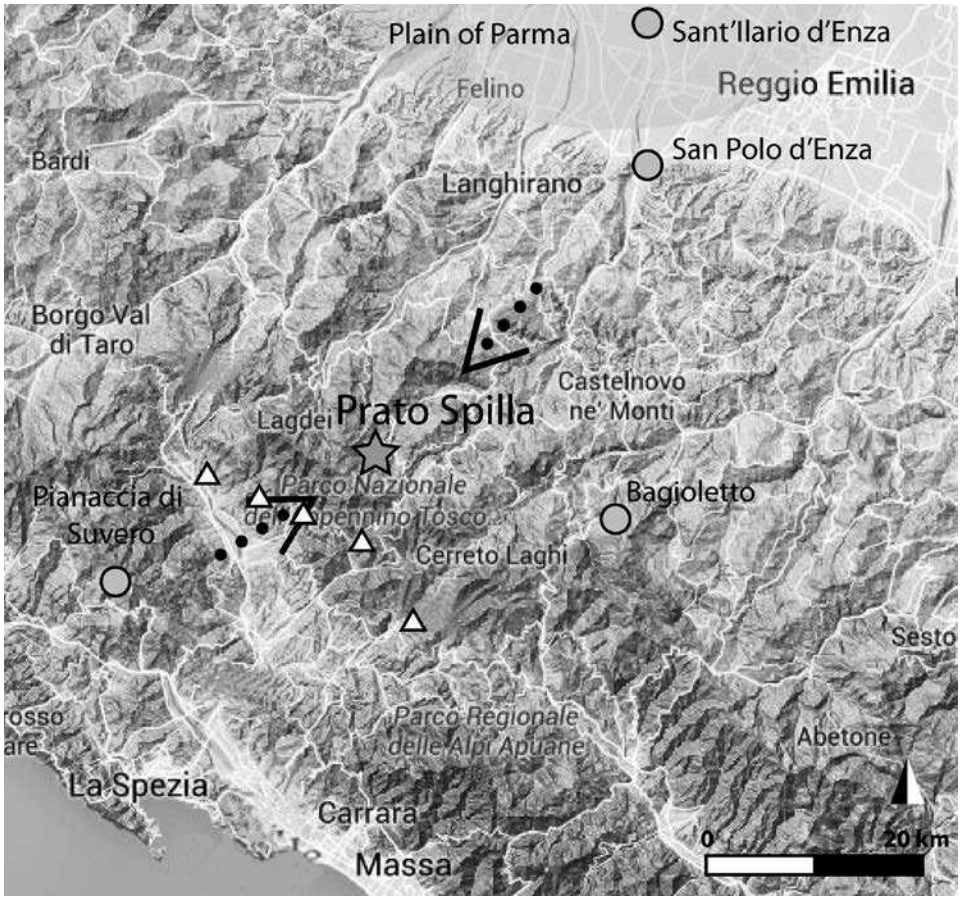

Figure 5. Prato Spilla 'A' (star), the nearest finds of Neolithic/Eneolithic sites (triangles), and the nearest Neolithic and Eneolithic sites south and north of the Apennine threshold (dots).

located at 1700 m a.s.l. *c.* 20 km from Prato Spilla, previously already occupied during the Mesolithic (Cremaschi *et al.* 1981; Cremaschi 1990). These distances are more compatible with short-range pastoral systems, which are more likely to have occurred in later prehistory (Figure 5). In this respect, it is useful to stress that the Early Neolithic rhomboid point found in eastern Liguria at Mt. Aiona-Prato Mollo (Province of Genova) is near to the Fiorano types (Baffico *et al.* 1987), suggesting that also the Apennine watershed was exploited by groups culturally linked to the plain of Parma. Moreover, a number of studies have stressed multiple relationships between Emilia and Liguria in the Neolithic (Bagolini and Biagi 1973, 1974; Biagi 1973).

However, even if we accept the existence of any form of transhumance, including long-range systems, the absence of known seasonal sites in the vicinity of the mire (presumably in a range of 0-5 km) remains difficult to explain. Potential summer pastures should indeed be associated with sites interpreted as possible seasonal camps (or at least with archaeological artefacts), as is the case of Mt. Galero and Tana del Barletta in western Liguria (Barker *et al.* 1990; Maggi and Nisbet 1991). In our case, it is relevant to stress that the north-easternmost finds of statue-stelae lie 7 to 12 km from Prato Spilla and belong to the Filetto-Malgrate-type, which is dated to the Copper Age on the basis of the weapons and ornaments represented (de Marinis 1994). These monuments are characteristic of the Eneolithic of Lunigiana and Garfagnana (between eastern Liguria and north-west Tuscany), and are interpreted as ritual images placed along pastoral routes linking settlements and pastures (Maggi 1998b).

Two high-altitude mires in eastern Liguria have provided direct evidence for *in situ* human presence, albeit scant and sporadic. An ornament dated probably to the Copper Age has been collected at Lago di Bargone (830 m a.s.l.) (Campana *et al.* 1998), where contemporary low anthropogenic disturbance has been suggested by pedological and palynological analyses (Cruise *et al.* 2009). At Mt. Aiona-Prato Mollo

(1700-1500 m a.s.l.), there is instead evidence for periodic human presence since the Early Neolithic (Baffico *et al.* 1987). A further point supporting the existence of this extra-settlement area being used as an upland pasture is the presence of a number of arrowheads from the Copper Age – Early Bronze Age (Baffico *et al.* 1987; Maggi 1998c; Maggi and Campana 2008). Although commonly interpreted as related to hunting, and occasionally as ritual offers (Leonardi and Arnaboldi 1998), the finds may be consistent with the interpretations from similar sites, that stress the necessity to guard the livestock against robbers or rival groups (Marzatico 2007; on the rise of violence during later prehistory see Meyer *et al.* 2015). The importance of controlling and defending upland resources for early European herders seems confirmed by the case of Talheim (southern Germany), where a large Early Neolithic mass grave containing the bones of 34 individuals of both genders and various ages was found. Isotopic evidence has suggested that some of the deceased, considered as a family group killed by a rival community, may possibly have been involved in forms of vertical transhumance between high pastures and *Linearbandkeramik* valley settlements (Price *et al.* 2006).

Conclusions

The main research outcomes can be summarised as follows:

- although an involvement of prehistoric shepherds in the uplands cannot be totally ruled out, it is likely that the continuous presence of coprophilous fungal spores in the Middle Holocene sediments at Prato Spilla 'A' originates from wild mountain herbivores, most likely ungulates, and perhaps also lagomorphs;
- the main difficulties for assuming pastoralism lie in the distance from known archaeological sites (*c.* 20-30 km), and the unlikelihood of long-range transhumance in prehistory, that has often been questioned in the literature (e.g. Marzatico 2007). Nevertheless, sporadic human presence in a shorter distance range is indicated by Copper Age statue-stelae, and in the case of other isolated uplands is shown by the artefacts recovered at Prato Mollo and Lago di Bargone;
- if any, it is likely that episodes of upland pastoralism should not be attributed uniquely to the Ligurian Neolithic groups, but also to the communities settled in the densely occupied plain of Parma;
- it is essential that specific methods (biogeochemistry, DNA metabarcoding) are applied in order to enable distinction between wild- and domestic-derived organic inputs (D'Anjou *et al.* 2012; Giguet-Covex *et al.* 2014).

Finally, it is worth stressing that the picture is indeed made even more intricate by the small size of Neolithic communities (Maggi and Nisbet 1991). Family-sized groups acting in the uplands with small herds may have only slightly impacted the environment, being difficult to detect nowadays in the palaeoecological record (Barker 1985; Festi *et al.* 2014). The very first transhumant pastoralism may thus have left very weak traces (Gifford 1978), and the application of local proxies for herbivore presence to other potential upland pastures is needed to better elucidate the situation in the Liguro-Emilian region.

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